MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2015/2016

EEL1166 – CIRCUIT THEORY

(All sections / Groups)

13 OCTOBER 2015
2:30 P.M. - 4:30 P.M.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 6 pages with 4 Questions only.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

Question 1

(a) State the Superposition theorm and provide the steps to apply to circuit.

[4 marks]

(b) Using the Superposition Principle, determine the current, i_0 in the circuit given in Figure Q1(b).

[10 marks]

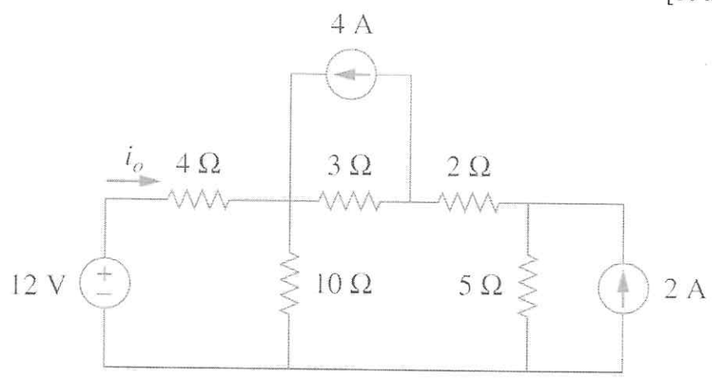

Figure Q1(b)

(c) Find the Thevenin equivalent between the terminals ***a*** and ***b*** in the circuit given in Figure Q1(c).

[11 marks]

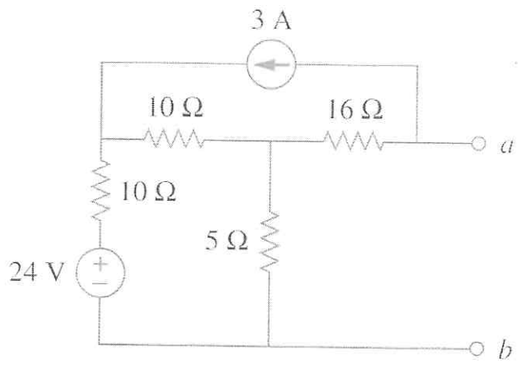

Figure Q1(c).

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Question 2

(a) Refer to Figure Q2(a),

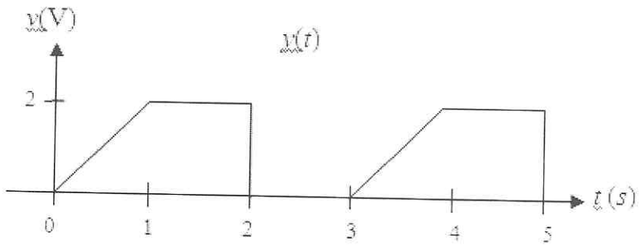

Figure Q2(a)

(i) write the mathematical expression of the wave for one cycle time. [3 marks]

(ii) Find the average value of the waveform. [1 marks]

(iii) Determine the percentage of duty cycle. [1 marks]

(iv) Calculate the root mean square value of the waveform. [2 marks]

(v) Determine the crest factor and form factor of the waveform. [2 marks]

(b) (i) Use Nodal Analysis to find the resistance value of R shown in the circuit of Figure Q2(b) such that the voltage across the 6-Ω resistor, V_2 is equal to 20 V.

[9 marks]

(ii) Check your answer in part (b)(i) by using a series source transformations method.

[7marks]

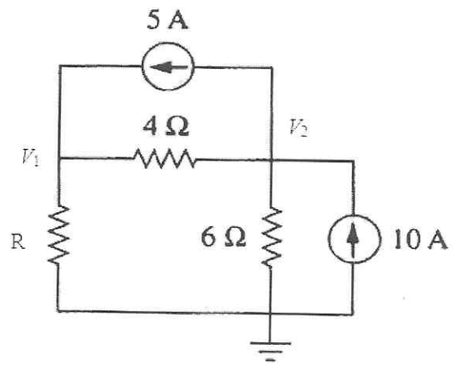

Figure Q2(b)

Continued.....

Question 3

(a) The Sinusoidal *RC* Circuit is shown in Figure Q3 (a), which has impedance (300- j420) Ω. Find the following parameter.

(i) Values of the resistance and capacitive reactance.

[2 marks]

(ii) The magnitude and phase angle of the circuit impedance in the polar form.

[3 marks]

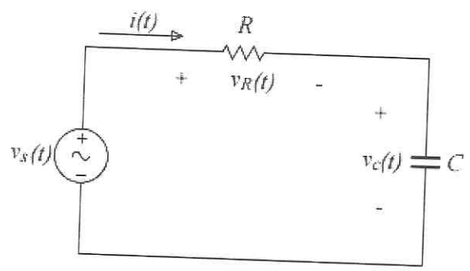

Figure Q3(a)

(b) The sinusoidal *LC* circuit is shown in Figure Q3 (b). The voltage $V = 12 \cos(60t + 45°)$ is applied to a *LC* circuit. Given values $L = 0.2$ H and $C = 70$ μF. Find the steady-state current through the inductor and capacitor.

[8 marks]

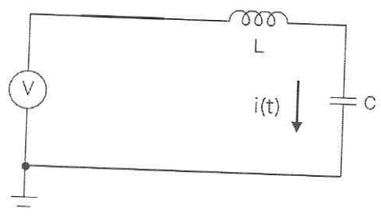

Figure Q3(b)

(c) A parallel *RLC* circuit is resonant at 10 MHz, has a Q-factor of 90 and has a resistive branch of 80 kΩ. Determine the values of L and C in other two branches.

[6 marks]

Continued……..

(d) A coil with resistance 5 Ω and inductance 400 mH is connected in series with a capacitor of 30 pF, a resistor of 5 Ω and a signal generator that gives 200 V_{rms} at all frequencies. Calculate

(i) the frequency ω_0, [3 marks]

(ii) the quality factor, Q_s, and [2 marks]

(iii) the bandwidth, BW (in rad/second). [1 mark]

Question 4

(a) The switch in Figure Q4(a) is closed initially and then it opens at $t = 0$. Find the current $i(t)$ for $t > 0$. [9 marks]

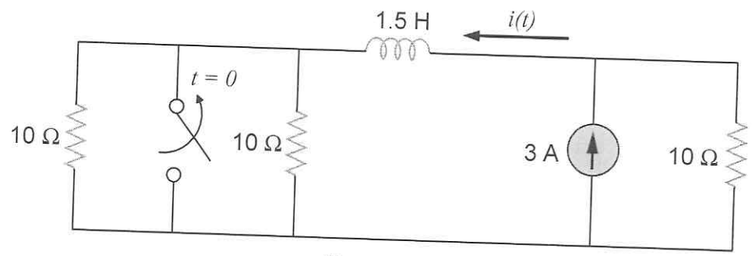

Figure Q4(a)

Continued.....

(b) For the circuit in Figure Q4(b), the switch has been open for a long time. At $t = 0$, the switch is closed. Determine the type of response will the circuit have and calculate $v(t)$ for $t > 0$.

[16 marks]

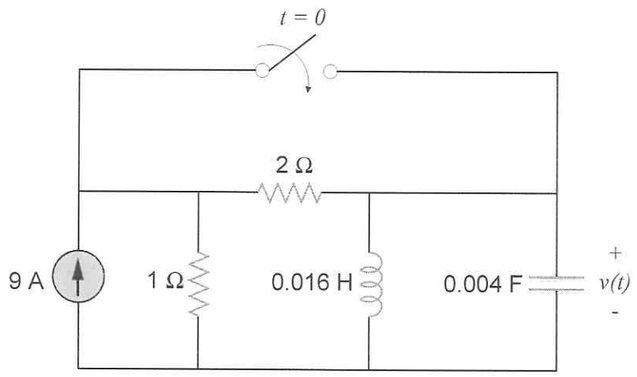

Figure Q4(b)

End of paper